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A new species of the Holarctic genus *Schistostoma* Becker (Diptera: Microphoridae) from South Africa, and first record of the family from South America

by

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ABSTRACT

The first Afrotropical species of the Holarctic genus *Schistostoma* Becker is described from the Cape Province of South Africa. *Schistostoma stuckenbergi* sp. n. is a relict species with a full set of plesiomorphic character states; its habitat preference, ecology and behaviour, close to the supposed ancestral forms, are ascribed to its long isolation. Its possible dispersal from the Mediterranean subregion is also discussed. A female of an unnamed *Microphor* sp. is reported from South Chile (Chiloe Island), being the first record of the Microphoridae from South America.

INTRODUCTION

The Microphoridae is a relict Holarctic family of flies phylogenetically closely related to the Dolichopodidae, within the superfamily Empidoidea. Four Recent genera are classified in two subfamilies: the Microphorinae (*Microphor* Macquart and *Schistostoma* Becker) and the Parathalassiinae (*Parathalassius* Mik and *Microphorella* Becker). The groundplan of the Microphoridae is essentially plesiomorphic relative to the Dolichopodidae, representing a relict (Cretaceous) group of about 50 Recent species, and sharing a common ancestor with the Dolichopodidae. The latter family, with over 4000 Recent species, is suggested to be much younger, with rich speciation in the Palaeogene only.

Only a few species of Microphoridae are known from outside the Holarctic region. Two species were described from Australia: *Microphor hiemalis* White, 1916 from Tasmania (generic status uncertain), and *Microphorella iota* Colless, 1963 from New South Wales. No records are available from the Oriental Region, and the same has applied until now to the Neotropical Region. However, a new *Microphor* species, which is left undescribed, is recorded from Chile (see below), being the first record from the Neotropical Region.

In the Afrotropical Region only *Parathalassius* has been known with certainty from South Africa. *Edenophorus* Smith, originally included in the *Microphorus*-group of genera, is very probably a member of the hybotid subfamily Ocydromiinae (see Chvála 1981: 230). The distribution of the South African species *Parathalassius capensis* Smith, 1972 is disjunct relative to the only other congeners in the northern hemisphere, namely three North American species and the type species *P. blasigii* Mik, 1891, recorded from the Mediterranean subregion (southern Europe, North Africa, and the Azores) (Chvála 1988). However, *Parathalassius* seems to be well represented in South Africa. Dr Hans Ulrich (*pers. comm.*), collected three different species from the Cape Province and Natal in 1989, during a search for additional specimens of *P. capensis*.

Schistostoma is reported here as the second Afrotropical genus of Microphoridae, collected in 1982 by Dr Brian Stuckenberg from Studers Pass, northeast of Garies in the northwestern Cape Province of South Africa. Through the kindness of Dr Stuckenberg I have been able to study this material.

TAXONOMY

Schistostoma stuckenbergi sp. n.

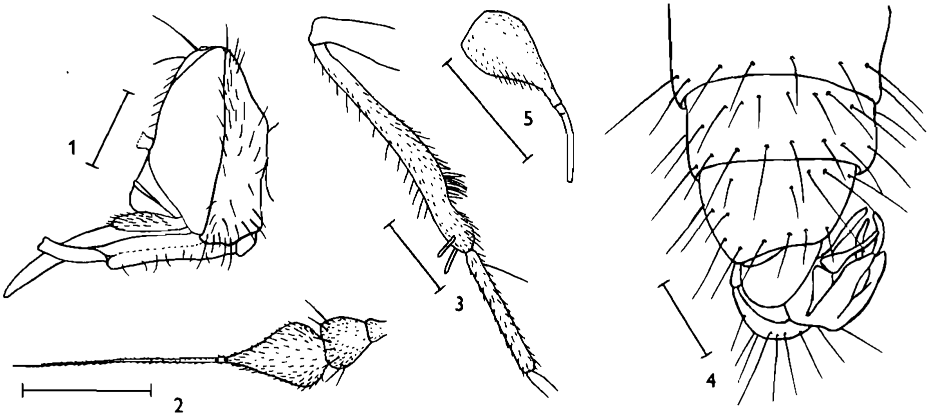
Figs 1–4, 6–12

Subshining black species with black legs and long, projecting proboscis; all hairs and bristles black. Antennae *Microphor*-like, with long terminal style. Mesonotum with full set of bristles, including 2 pairs of scutellars. Mid tibia of male curiously curved and spined apically.

Etymology: The species is named after Dr Brian Stuckenberg, who collected the type series.

Differential diagnosis: Considering the structure of the *Microphor*-like antennae, the distinct bristles on head and thorax, and the uniformly black legs, *S. stuckenbergi* sp. n. belongs to the plesiomorphic *Schistostoma truncatum*-group (*sensu* Chvála (1987)). In the key to Palaearctic *Schistostoma* species (Chvála 1987: 139) it runs to the Greek species *S. nigrosetosum* Chvála, which is undoubtedly also its closest relative. The latter species differs, however, in the shorter antennal style (about as long as segment 3), in the much more produced face and shorter proboscis, the blackish halteres, and the whitish abdominal pubescence.

Male: Dimensions (holotype in parentheses): Body length 2,1–2,3 (2,3) mm; wing length 2,3–2,5 (2,4) mm.



Figs 1–5. *Schistostoma* and *Microphor* species. 1–4. *S. stuckenbergi* sp. n., paratypes. 1. Female head in profile (antennae omitted). 2. Male antenna. 3. Male mid tibia and metatarsus, anterior view. 4. Male postabdomen, dorsal view. 5. *Microphor* sp. female (Chile), third antennal segment. Scale lines = 0,2 mm.

Head: Eyes meeting for a long distance on frons, leaving only a small grey triangle above antennae; anterior eye facets above antennae slightly enlarged and covered with scattered, indistinct, pale microscopic hairs. Ocellar tubercle convex with 2 pairs of black, fairly long ocellar bristles, these indistinguishable in length from row of black bristles on postocular margin. Occiput black, thinly brownish grey dusted laterally; upper part almost bare except for upper postocular bristles, lower part with shorter black hairs. Antennae (Fig. 2) black, segment 2 with circlet of black pre-apical bristles; segment 3 broad basally, short-conical, with microsocopic hairs; likewise the long slender style, which is about twice as long as segment 3. Palpi long ovate, though shorter than half length of proboscis, black, on apicoventral third and pre-apically with fairly long black bristles. Proboscis very long, about as long as head height, directed forwards or obliquely forwards; labrum polished black, entirely shielded ventrally by fleshy labium (if porrect), labella (Fig. 1) fairly long and flattened, about one-third labium length.

Thorax: Ground colour black, mesonotum rather thinly dark grey dusted, leaving darker narrow subshining vittae down lines of dorsocentrals, pleura lighter grey dusted. Mesonotal bristles large and black: 1 strong humeral with 1–3 smaller bristles; 1 posthumeral; 2–3 smaller intrahumerals; usually 3 strong notopleurals with slightly smaller bristles in notopleural depression and a row above it; 1 strong postalar bristle. Acrostichals irregularly 3–4-serial; dorsocentrals regularly 1-serial, ending in 2 pairs of strong prescutellar bristles; all fairly long and bristle-like. Scutellum with 2 pairs of marginal bristles, outer pair shorter. Prosternum small, well separated by membrane from prothoracic episterna, each with tuft of short black bristly hairs.

Wing (Fig. 6): Very faintly brownish grey clouded, veins blackish; distinct black costal bristle with 2–3 shorter bristles towards wing base. Stigma brown, distinctly darker, positioned along costa between Sc and R_1. Squamae ash-grey with dark fringes; halteres light brownish, base of stem dark.

Legs: Black to blackish-brown, fairly long and slender, covered with short black bristly hairs. Fore femora with the longest bristles posteroventrally, those on mid femora before tip nearly as long as femur is deep, similar long bristly hairs dorsally on hind femora. Fore tibiae posterodorsally and hind tibiae dorsally with hairs shorter than corresponding tibial depths. Tarsi with short hairs, but mid

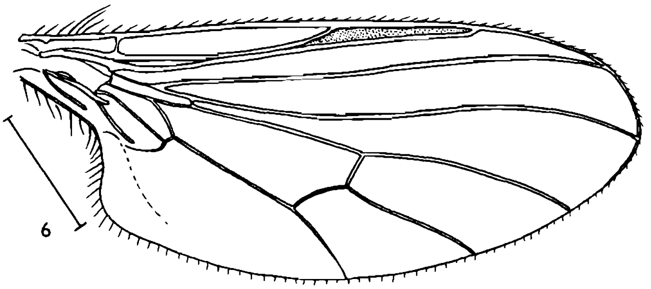


Fig. 6. *Schistostoma stuckenbergi* sp. n., paratype ♂, wing. Scale line = 0,5 mm.

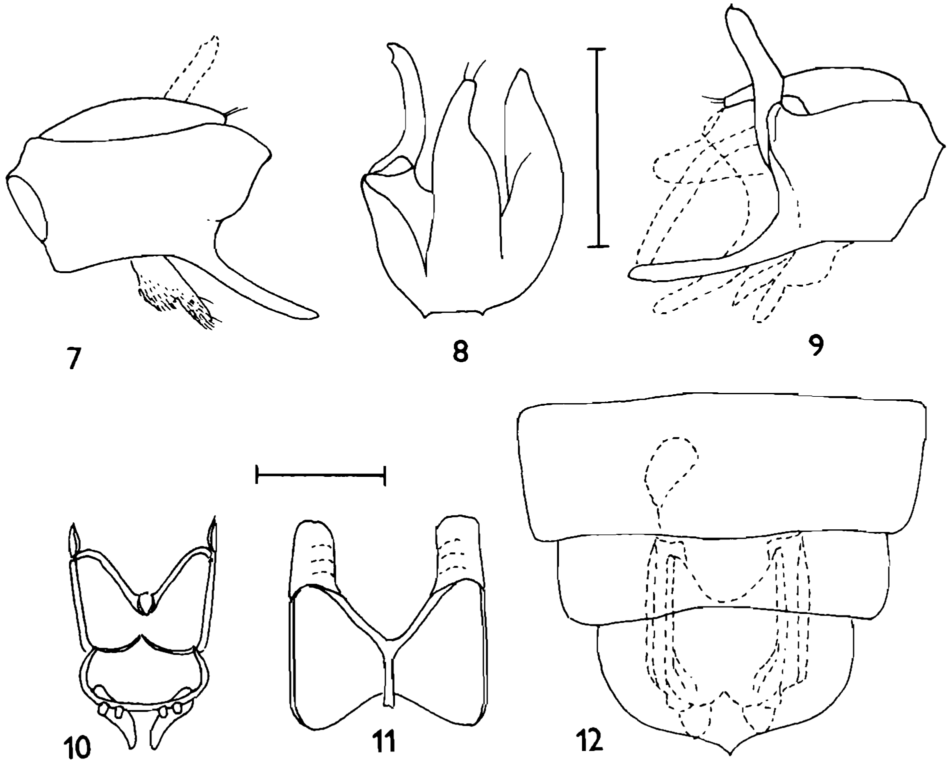
metatarsus with strong ventral bristle at base. Mid tibiae (Fig. 3) slightly curved and stouter on apical half, ventro-apical third with shallow excision armed proximally with tuft of short black spines, and dorso-apically with pair of rather short flattened bristles.

Abdomen: Subshining black, only thinly dark grey dusted and covered with exclusively black hairs and bristles. Terga almost bare dorsally, but sides densely covered with long bristles which are distinctly longer than abdomen is broad in dorsal view. Sterna more greyish dusted, basal 2 sterna with large marginal bristly hairs, successive sterna with minute hairs only, but sternum 8 (dorsally positioned due to twisting of pregenital segments) conspicuously long black bristled (Fig. 4). Genitalia as in Figs 7–9.

Female: Dimensions: Body length 1,5–2,0 mm; wing length 2,2–2,4 mm.

Similar to male, but distinguished as follows:

All bristles on head, thorax and abdomen shorter, and mid tibiae simple. Eyes apparently bare, broadly separated by wide triangular frons, eye facets almost



Figs 7–12. *Schistostoma stuckenbergi* sp. n., paratypes. 7–9. Male genitalia. 7. Left periandrial lamella with hypandrium (above), cercus (below) and upper appendage of right lamella dotted. 8. Hypandrium viewed from above (originally below), with right periandrial lamella (left) and left lamella (right). 9. Right periandrial lamella and hypandrium (above), with cerci, left lamella and aedeagal complex dotted. 10-12. Female genitalia, dorsal view. 10. Tergum 8 and proctiger. 11. Tergum 7. 12. Postabdomen (terga 7–8 and spermatheca dotted). Scale lines = 0,2 mm.

equally small, orbitals with row of short, but fairly strong black bristles. Face usually with well pronounced buccal margin (not visible in all males studied) (Fig. 1). Upper occipital (postocular) bristles and all mesonotal bristles decidedly shorter. Acrostichals almost 3-serial, the longer thoracic bristles being a humeral, a posthumeral, 2–3 notopleurals, a postalar, last pair of prescutellar dorsocentrals and the inner pair of scutellars. Halteres light brownish. Legs with longest bristly hairs apparently in posterodorsal row on fore femora and in dorsal row on hind femora. Abdomen less subshining dorsally; all bristles, including those laterally on terga, much shorter. Tergum 6 rounded posteriorly, shielding acanthophorous intruded 'ovipositor' (for details see Figs 10–12).

Material examined: Holotype ♂, SOUTH AFRICA: *Cape Province*: Studers Pass, 22 km NE Garies, 3018AC, 6.ix.1982, J. Londt & B. Stuckenberg, Stream edge & rocky slopes. Paratypes: 5 ♂ 3 ♀, same data. Holotype and paratypes (except 1 ♂ 1 ♀ in author's collection) deposited in Natal Museum, Pietermaritzburg (NM Type No. 321).

Discussion: All Recent Palaearctic *Schistostoma* species have a circum-Mediterranean distribution, extending east to Mongolia and northeastern Tibet. They are all apparently inhabitants of warm sandy biotopes, either of coasts or of dry sandy dunes far inland. The South African *S. stuckenbergi* sp. n. differs substantially from all its Palaearctic relatives both in morphology and ecology, emphasising its very long isolation.

Phylogenetically *stuckenbergi* undoubtedly is the most ancient member of *Schistostoma*, as the main morphological character states are clearly plesiomorphic compared with the usual condition in Palaearctic species. These include: (1) the partially haired eyes, with microscopic hairs present anteriorly on the enlarged facets; (2) the long proboscis; (3) the long flattened labella, about one-third length of labium; (4) the male genitalia with a simple hypandrium and undifferentiated terminal opisthypandrium. In addition to these unique plesiomorphic character states, there are many further plesiomorphic features which are present in at least some species of the *S. truncatum*-group: antennae *Microphor*-like, body subshining black, legs black, distinct full complements of cephalic and thoracic bristles, all bristling and abdominal pubescence black. Besides the apomorphic sensory excavation and bristling on the mid tibia of the male, all major character states are plesiomorphic. *S. stuckenbergi* undoubtedly represents a relict species, with plesiomorphic character states preserved by its long isolation in a very restricted and, it is believed, unique habitat.

The habitat of *stuckenbergi* is very different to those biotopes occupied by Palaearctic *Schistostoma* species. According to Stuckenberg (*pers. comm.*) the South African species is possibly confined to the headwaters of small mountain streams at relatively high altitudes. The flies were collected from a small swarm in the air over a rock adjacent to a pool; several copulating pairs were resting on the rocks. The type locality—Studers Pass—is on the western face of the Rooiberg Mountain, an isolated massif with a maximum altitude of about 1700 m, standing conspicuously higher than the lowland country to the west. The surrounding escarpment, running roughly parallel to the coast, is not high enough to result in significantly increased rainfall, but the Rooiberg Mountain itself is exceptionally prominent and is responsible for an isolated patch of high rainfall. The presence of the South African *Schistostoma* species on the Rooiberg Mountain is made possible by the steepness of its slopes (facilitating runoff) and its high rainfall, but is surprising considering how isolated the mountain is in physiographic and climatic terms. According to Stuckenberg, such mountain-stream flies could have arrived there only by range extension along the escarpment to the south in times of higher rainfall.

The habitat preference of *stuckenbergi* could well be considered plesiomorphic for the genus, and the Palaearctic species, undoubtedly much more specialised, have inhabited the warm sandy biotopes only secondarily. Moreover, the South African species has retained another very ancient habit, as in *Microphor* species, of swarming and mating in the air. This habit is unknown in the Mediterranean *Schistostoma* species. There is an analogy in *Microphorella* species (Parathalassiinae), supporting the above opinion. The three Palaearctic *Microphorella* species inhabit sandy biotopes like the *Schistostoma* species, but the Australian *M. iota* was swept near streams and on moist rocks in a slowly trickling watercourse, and the unnamed Nearctic (Californian) *Microphorella* species inhabits large rocks in streams and, like *stuckenbergi*, has been observed swarming above the rocks (Chvála 1983).

Schistostoma stuckenbergi represents a Palaearctic element in the South African fauna. The highly isolated distribution of this new species, as well as its known habitat, suggest that its ancestors were cold stenotherms. The habitat preference of some *Microphorella* species may well be good evidence. The presence of a cold, montane route between the Mediterranean subregion and the Afrotropical Region was recently fully discussed by Willassen & Cranston (1986) for *Diamesa* midges. The possible long southward dispersal of *Schistostoma* species well supports their hypothesis. The geological evidence for a Tertiary montane route linking the eastern Mediterranean with the Ethiopian Highlands suggests that this southward movement was very possible. Also de Jong (1976) demonstrated in butterflies the very simple southward routes for temperate species during cold periods, especially one from the eastern Mediterranean along the Red Sea south to Ethiopia. The optimal time for such a southward dispersal of cold stenothermic insects associated with cold running water (including glacial melt streams), was during the Pleistocene, if not earlier (Willassen & Cranston 1986).

The phylogeny of *Schistostoma* and the Microphoridae in general, suggests that the ancestral forms of the *S. truncatum*-group, with a full set of plesiomorphic character states retained in *S. stuckenbergi*, should have spread southwards by the late Palaeogene, or at least during the Miocene-Pliocene. Considering that the most closely related Palaearctic species to the South African *S. stuckenbergi* is the eastern Mediterranean *S. nigrosetosum* (phylogenetically the oldest Palaearctic species), the eastern route along the Red Sea and the Ethiopian Highlands seems to be very likely. It is suggested that *stuckenbergi* must have dispersed from North Africa down the interrupted chain of mountains towards the south during cold and moist periods, at least during the early Miocene.

Microphor sp.

Fig. 5

Dr Stuckenberg also sent me a single female of *Microphor*, taken during his collecting trip to Chile in 1987. The specimen is labelled as follows: 'Chile, Chiloe Island, 11 km SE Chonchi on road to Queilen, forest slopes near ocean, 8.xii.1987, leg. B. R. Stuckenberg'. This record is surprising as I have recently studied a very large collection of 'Empididae' from South Chile and Argentina, taken by the Danish Expeditions in 1978–1981, and I did not find any specimens of Microphoridae.

The specimen is a typical *Microphor* female, having a tapered telescopic 'ovipositor' with slender terminal cerci. It runs in my key to Palaearctic *Microphor* females (Chvála 1986: 438) to *M. crassipes* Macquart. However, the separation of females is often difficult without associated males, and since I am not well acquainted with the Nearctic *Microphor* species, only a short diagnosis of the Chilean species is given here, it being left undescribed:

Female: Dimensions: Body length 1,8 mm; wing length 2,3 mm.

Subshining black species, all bristles and hairs on body and legs black.

Eyes bare, broadly separated by subshining frons; eye facets equally small. Anterior pair of ocellar bristles very conspicuous and forwardly directed, about as long as antennal style; posterior pairs small. Vertical bristles not differentiated from upper occipital bristles, all not much longer than small posterior ocellar bristles. Antennae black, segment 3 (Fig. 5) very broad on basal three-quarters, almost spherical, apical part slender, as deep as style; latter shorter than 3rd segment. Proboscis forwardly directed, nearly as long as head depth. Palpi black, fairly long, slightly shorter than proboscis and practically bare, very slender on basal two-thirds, slightly wider apically.

Mesonotum subshining black, scutellum more brownish grey dusted. Acrostichals small and very narrowly biserial, broadly separated from slightly longer multiserial dorsocentrals, but these with 2 strong prescutellar pairs. Mesonotal bristles: 1 long humeral, with 3–4 shorter bristles anteriorly; 1 strong posthumeral; 2 intrahumerals; 3 notopleurals; 1 supra-alar; 1 postalar. Scutellum with 2 pairs of marginal bristles, inner pair cruciate and very strong, though scarcely longer than postalar and prescutellar dorsocentrals, outer pair half this length. Wings almost clear with dark veins, venation unremarkable, costal stigma not visible. Halteres blackish brown.

Fore femora with tuft of black, rather stubby spines anteriorly near base, posteriorly with short dense bristling. All tibiae with 1–2 short dorsal pre-apical bristles, these shorter than tibial depth; mid tibia with long dorsal bristle in basal third, almost twice as long as tibial depth. Hind femora with short bristling, apparently more swollen than fore femora (not well visible in specimen examined).

Abdomen subshining black, covered with short black bristly hairs, though apical 3 abdominal segments rather densely grey dusted when viewed from above. Apical cerci long and slender, covered with dark hairs, apically with single outwardly directed long hair.

REFERENCES

CHVÁLA, M. 1981. Classification and phylogeny of Empididae, with a presumed origin of Dolichopodidae (Diptera). *Ent. scand., Suppl.* **15**: 225–236.

——— 1983. The Empidoidea (Diptera) of Fennoscandia and Denmark, II. General Part. The Families Hybotidae, Atelestidae and Microphoridae. *Fauna ent. scand.* 12: 9–281.

——— 1986. Revision of Palaearctic Microphoridae (Diptera) 1. *Microphor* Macq. *Acta ent. bohemoslov.* **83**: 432–454.

——— 1987. Revision of Palaearctic Microphoridae (Diptera) 2. *Schistostoma* Beck. *Acta ent. bohemoslov.* **84**: 133–155.

——— 1988. Revision of Palaearctic Microphoridae (Diptera) 3. Parathalassiinae (*Parathalassius* Mik and *Microphorella* Becker). *Acta ent. bohemoslov.* **85**: 352–372.

DE JONG, R. 1976. Affinities between the West Palaearctic and Ethiopian butterfly faunas. *Tijdschr. Entomol.* **119**: 165–215.

WILLASSEN, E. & CRANSTON, P. S. 1986. Afrotropical montane midges (Diptera, Chironomidae, *Diamesa*). *Zool. J. Linn. Soc.* **87**: 91–123.

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